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She finds no conclusive evidence for or against the view that the tropic and growth stimuli of gravity in this organ are distinct. Her work makes it evident that the lack of growth in the older nodes with the stem vertical is due both to the lack of the stimulating transverse action of gravity, and to the presence of the inhibiting longitudinal action. Thus we see these responses to stimuli becoming more and more complex. One wonders whether a study of changes, acid and otherwise, induced in the tissues of the nodes by these various exposures might not simplify the matter. Such, I believe, is the possibility of real progress in this field.—WILLIAM CROCKER.

**Phylogenetic significance of endosperm.**—Nuclear endosperm and cellular endosperm, and also endosperm beginning its development with a free nuclear period and later passing into a cellular condition, have been known since the days of HOFMEISTER; and since that time various modifications and peculiarities have been described, some of them characterizing genera or families or even orders; while others seem to be confined to species. Whether the character of the endosperm has any phylogenetic significance or not, is a question which has often been discussed and often answered, both in the affirmative and in the negative.

The most recent discussion<sup>15</sup> is also the most comprehensive. It is a study of the literature rather than a laboratory investigation. For all the orders of Dicotyledons and Monocotyledons, the literature dealing with the endosperm has been assembled and discussed and charts have been made, so that it is possible to see at a glance just what the endosperm and haustorium conditions are in any order. In this bird's-eye view, the names of the principal investigators are given and full citations appear in an extensive bibliography. After describing the endosperm and haustorium situation in each order, often treating the families separately, sometimes the genera, and occasionally the species, the author adds a long summary dealing with orders. Both in the introduction and in the conclusion it is very plainly stated that the endosperm character is only one factor among many, but nevertheless endosperm and haustoria characters have great phylogenetic significance.—CHARLES J. CHAMBERLAIN.

**Temperature and photo-perceptions.**—In studying the influence of temperature upon phototropism in the coleoptile of *Avena sativa*, Miss DEVRIES<sup>16</sup> has determined the influence of temperature upon the rate of photo-perception and photo-reaction and the influence of previous heating upon the rate of these processes. She finds that van't Hoff's law of rate of chemical reaction

<sup>15</sup> JACOBSSON-STIASNY, EMMA, Versuch einer phylogenetischen Verwertung der Endosperm- und Haustorialbildung bei den Angiospermen. Sitzungsber. Kaiserl. Akad. Wiss. Wien 123:1-137. 1914.

<sup>16</sup> DEVRIES, M. S., Der Einfluss der Temperatur auf den Phototropismus. Extrait du Rec. Trav. Bot. Néerland. 11:195-291. figs. 7. 1914.

applies to photo-perception, with a coefficient of about 2.6 for 10° C. rise in temperature up to 30° C. It also applies to photo-reaction with a considerably smaller coefficient. Above 30° C. an injurious time effect of high temperature sets in, and finally at 40° C. the power of perception and response is soon lost. These results stand in contradiction to those of NYBERGH, who claimed that temperature ranging from -3° C. to 47° C. have little influence upon the photo-perception rate, indicating that the process is a strictly photo-chemical reaction such as occurs on the photographic plate. DEVRIES' work, on the other hand, lines these two processes up, so far as they are influenced in rate by temperature, with chemical reactions in homogeneous solutions in general, and with photosynthesis, respiration, and geo-perception.<sup>17</sup> From 0° to 25° C. the perception speed was independent of the time of previous warming. Long previous warming at 27.5-30° C. hastened perception rate, and such previous heating at 32.5° C. or higher temperatures slowed the perception rate. One hour's heating at 39° C. lowered the perception speed at 20° C. more than four-fold. This effect entirely disappeared, however, after four hours' storage at 20° C., and is therefore considered rather a matter of hysteresis than of the accumulation of poisonous materials.—WILLIAM CROCKER.

**Invasion of a prairie grove.**—In the high prairie just outside of Lincoln, Nebraska, a grove was started about forty years ago by running furrows at intervals of 4-6 feet through the prairie and dropping the tree seeds into the furrows. At present about 20 acres are thus forested with *Fraxinus pennsylvanica*, *Juglans nigra*, *Ulmus fulva*, *Acer saccharinum*, and *A. Negundo*. No culture has been attempted at any time during the history of the grove. nor has there been any damage by fire or grazing, hence the forested area affords an exceptionally good demonstration of the fact that trees grow freely once they are planted in this prairie soil, although they almost never invade the grasslands, and it also provides an unusually good opportunity of studying the changes in the undergrowth vegetation resulting from the changed conditions due to the tree growth. POOL<sup>18</sup> in investigating the character of the invasions has found that not only has the prairie sod gone, but nearly every one of the original prairie species has entirely disappeared, being replaced by some 90 invading species, of which 85 per cent are mesophytic and 60 per cent are distinctly woodland. Lists of these species prove how completely the area has been transformed from prairie to forest in a very short period. Doubtless changes in soil moisture, evaporation intensity, and light as the trees developed led to the changes in the undergrowth. POOL has these and other factors under investigation and doubtless his results will form a valuable contribution to the understanding of the problems of the relations existing between the grasslands and the forests.—GEO. D. FULLER.

<sup>17</sup> BOT. GAZ. 50:233-234. 1910; 51:239. 1911.

<sup>18</sup> POOL, R. J., The invasion of a planted prairie grove. Proc. Soc. Amer. For. 10:1-8. 1915.